RACH-RAMP-UP ACKNOWLEDGEMENT

RELATED APPLICATIONS

This application is a Continuation of U.S. application Ser. No. 11/979,117, filed Oct. 31, 2007 now U.S. Pat. No. 7,508, 861, which is a Continuation of U.S. application Ser. No. 10/412,576, filed on Apr. 14, 2003, now U.S. Pat. No. 7,359, 427, which is a Continuation of U.S. application Ser. No. 09/273,450, filed on Mar. 22, 1999, now U.S. Pat. No. 6,574, 267, the entire contents of each of which are hereby incorporated by reference.

BACKGROUND OF THE INVENTION

This invention relates spread-spectrum communications, and more particularly to code-division-multiple-access (CDMA) cellular, collision detection for packet-switched systems.

DESCRIPTION OF THE RELEVANT ART

Presently proposed for a standard is a random-access burst structure which has a preamble followed by a data portion. The preamble has 16 symbols, the preamble sequence, spread by an orthogonal Gold code. A mobile station acquires chip and frame synchronization, but no consideration is given to closed-loop power control or collision detection.

SUMMARY OF THE INVENTION

A general object of the invention is to detect collisions for packet data transfer on CDMA systems.

Another object of the invention is to maintain reliability for high data throughput and low delay on CDMA systems.

An objective is to provide random channel access with reliable high data throughput and low delay on CDMA systems

At a first RS-spread-spectrum receiver, the steps further include receiving the broadcast common-synchronization channel. From the broadcast common-synchronization channel, the steps include determining frame timing at the first RS-spread-spectrum receiver from the frame-timing signal.

From a first RS-spread-spectrum transmitter, the steps include transmitting an access-burst signal. The access-burst signal has multiple segments at different power levels, that is to say typically at sequentially increasing power levels.

The BS-spread-spectrum receiver receives at least one segment of the access burst signal at a detectable power level. In response, the BS-spread-spectrum transmitter sends an acknowledgment signal back to the first RS-spread-spectrum receiver. Receipt of the acknowledgment signal by the first RS-spread-spectrum receiver causes the RS-spread-spectrum transmitter to send data to the BS-spread-spectrum receiver. The detection of the segment at an adequate power level, acknowledgment communication and subsequent data transmission provides the remote station (RS) with random access to the channel (RACH).

The preferred embodiment also provides that when there is a collision of a first access-burst signal with a collision access-burst signal, then the BS-spread-spectrum receiver does not correctly receive the collision detection portion of the first access-burst signal. Thus, the BS-spread-spectrum transmitter transmits to the first RS-spread-spectrum receiver, an collision-detection without reflecting the collision-detection portion. At the first RS-spread-spectrum receiver, in response to receiving the collision-detection signal without the collision detection portion, the first RS-spread-spectrum transmitter transmits to the BS-spread-spectrum receiver, a second access-burst signal.

Additional objects and advantages of the invention are set forth in part in the description which follows, and in part are obvious from the description, or may be learned by practice of the invention. The objects and advantages of the invention also may be realized and attained by means of the instrumentalities and combinations particularly pointed out in the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are incorporated in and constitute a part of the specification, illustrate preferred embodiments of the invention, and together with the description serve to explain the principles of the invention.

FIG. **1** is a common packet channel system block diagram with a common control downlink channel;

FIG. **2** is common packet channel system block diagram with a dedicated downlink channel;

FIG. **3** is a block diagram of a base station receiver for common packet channel;

FIG. **4** is a block diagram of a remote station receiver and transmitter for common packet channel;

FIG. **5** is a timing diagram for access burst transmission;

FIG. **6** illustrates common packet channel access burst of FIG. **5** using a common control downlink channel;

FIG. **7** illustrates common packet channel access of FIG. **5** using a dedicated downlink channel

FIG. **8** shows the structure of the preamble;

FIG. **9** illustrates preamble and pilot formats;

FIG. **10** is a common packet channel timing diagram and frame format of the down link common control link; and

FIG. **11** illustrates frame format of common packet channel, packet data.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Reference now is made in detail to the present preferred embodiments of the invention, examples of which are illustrated in the accompanying drawings, wherein like reference numerals indicate like elements throughout the several views.

The common-packet channel is a new and novel uplink transport channel for transmitting variable size packets from a remote station to a base station within listening range, without the need to obtain a two way link with any one or set of base stations. The channel resource allocation is contention based; that is, a number of mobile stations could at any time content for the same resources, as found in an ALOHA system.

In the exemplary arrangement shown in FIG. **1**, common-packet channel provides an improvement to a code-division-multiple-access (CDMA) system employing spread-spectrum modulation. The CDMA system has a plurality of base stations (BS) **31**, **32**, **33** and a plurality of remote stations (RS). Each remote station **35** has an RS-spread-spectrum transmitter and an RS-spread-spectrum receiver. An uplink is from the remote station **35** to a base station **31**. The uplink has the common-packet channel (CPCH). A downlink is from a base station **31** to the remote station **35**, and is denoted a common-control channel (CCCH). The common-control channel has common signaling used by the plurality of remote stations.

An alternative to the common-control channel, but still using the common-packet channel, is the downlink dedicated